VALID UNTIL 5/4/07

APPENDIX 3 - REDUCING IDLING EMISSIONS FROM HEAVY-DUTY VEHICLES

This appendix addresses the project criteria for idling reduction technologies that may be installed on on-road heavy-duty vehicles. Projects that meet the criteria may be considered for Carl Moyer Program funding.

Below is additional information pertaining to the Heavy-Duty Vehicle Idling Reduction category under AQMD's FY 2007 Carl Moyer Program (CMP). All information in **PA# 2007-08** and this Appendix apply. For additional detail regarding this program category, refer to CARB's 2005 CMP Guidelines. In the case of any conflict between CARB guidelines and AQMD criteria, the more stringent criteria will prevail.

Recent airborne toxic control measures (ATCM) have placed a number of restrictions on idling. These are described below in the excerpts from the CARB CMP guidelines. Only projects that have emission reductions that exceed these measures are eligible.
It is the Applicant's responsibility to check with AQMD's CMP web page for program clarifications, changes and updates. This page may be accessed by clicking the link on AQMD's home page at http://www.aqmd.gov/tao/implementation/carl_moyer_program_2001.html.

CARB MOYER PROGRAM RESOURCES

Applicants are highly encouraged to review CARB guidelines for additional requirements of the CMP. CARB guidelines are incorporated into AQMD's Moyer Program by reference. 2005 CARB guidelines may be downloaded from:

http://www.arb.ca.gov/msprog/moyer/guidelines/revisions05.htm

On this web page, there are links to the four parts of the CARB 2005 CMP guidelines. These parts are described below for easy reference.

- Part I provides the Executive Summary, Program Overview and Administrative Requirements primarily applicable to air districts) for CARB's Carl Moyer Program. The link to Part I is http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part1.pdf

- Part II provides the Project Criteria for each program category. The link to Part II is http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part2.pdf

- Part III provides the Agricultural Assistance Program guidelines. Link to Part III at http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part3.pdf

- Part IV is the Appendices section of the guidelines. The link to Part IV is http://www.arb.ca.gov/msprog/moyer/guidelines/2005_Carl_Moyer_Guidelines_Part4.pdf . This section includes the following Appendices.

    - Appendix A – Acronyms
    - Appendix B – Tables for Emission Reduction and Cost-Effectiveness Calculations
    - Appendix C – Cost-Effectiveness Calculation Methodology
    - Appendix D – Example Calculations
    - Appendix E – Description of Certification and Verification Executive Orders
    - Appendix F – Retrofit Emission Control Strategies
    - Appendix G – Description of Functional Equivalency of Non-Original Equipment Manufacturer Repowers and Rebuilt Engines for use in Repowers

HIGHLIGHTS FOR 2007

- The project cost-effectiveness limit is $5,000 per weighed ton of NOx, PM and ROG emissions reduced. A four (4) percent capital recovery factor is used for the cost-effectiveness calculation.

- Cost-effectiveness calculations are based on particulate matter (PM10), oxides of nitrogen (NOx), and reactive organic gases (ROG). The formula established by CARB is provided below. AQMD staff will calculate the NOx, PM and ROG emissions reductions and apply the formula during the evaluation process.

$$\frac{\text{Annualized Cost (\$/year)}}{\text{NOx reductions + 20(combustion PM10 reductions) + ROG reductions (tons/year)}}$$

- Applicants **must** provide current vendor quotes, **obtained within the last 90 days**, with their application to document the incremental cost of implementing the proposed technology. This will require documentation of both the baseline and low-emission project costs. Applicants can request funding up to the differential cost between an optionally certified low-emission vehicle/engine/equipment and its new base standard emission equivalent; however, less may actually be awarded, depending on the results of the cost-effectiveness evaluation. Some cost restrictions apply to specific technologies; these are discussed below.

- Applicants **must** also provide documentation that justifies the activity level projected for the vehicles (i.e., mileage logs, hour-meter records, business records, fuel receipts, etc.). Projects that utilize a fuel-based calculation must provide fuel receipts for the past 24 months to justify the fuel consumption activity projected for the vehicle.

- All projects must be operational within eighteen (18) months of contract execution or by May 31, 2009, whichever is earlier.
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- If the horsepower rating of the new engine exceeds that of the existing engine by 25 percent or more, the difference in the rating will be taken into account in the emission reduction calculation.

- Minimum project life is three (3) years. Longer project lives may be approved by CARB and AQMD on a case-by-case basis.

- The new engine/equipment/vehicle must not have been purchased prior to the effective date of the contract.

- AQMD reserves the right to disqualify any application that does not comply with all applicable requirements including submission of a complete application package.

- Part One of Attachment 1 of the AQMD Application Form requires that **all** repower and retrofit projects provide the vehicle identification numbers (VINs) for the project vehicles in both hard copy and electronic format. This information will be provided to ARB for an ARB Violation Compliance Check. Any outstanding violations for a project vehicle must be resolved in advance of contract execution.

- Pre- and Post-Inspection of all project equipment/ approved for funding is required as well as verification of engine destruction. Payment will be made only after all inspections are completed and old equipment destruction is verified (if applicable).

- Please review CARB's CMP Guidelines, Part IV, Appendix E for a comprehensive description of certification Executive Orders for new engines and Verification Letters for retrofit devices.

EVALUATION METHODOLOGY

AQMD staff will evaluate all submitted proposals and make recommendations to the Governing Board for final selection of project(s) to be funded. Proposals will be evaluated based on the cost-effectiveness of emissions (NOx + ROG + 20*PM) reduced on an equipment-by-equipment basis, as well as a project's "disproportionate impact" evaluation (discussed below). Be aware of the possibility that due to program priorities and/or funding limitations, project applicants may be offered only partial funding, and not all proposals that meet minimum cost-effectiveness criteria may be funded.

In compliance with AB 1390, Firebaugh, the FY 2007 CMP requires that at least 50 percent of the funds be spent in areas that are disproportionately impacted by air pollution. CARB has issued broad goals and left the details of how to implement this requirement to each air agency. In the South Coast Air Quality Management District, the disproportionately impacted areas are defined by a weighted formula that includes poverty level, particulate matter (PM) exposure and toxic exposure. The process is described below:

1. All projects must qualify for the CMP by meeting the cost-effectiveness limits established in the PA.

2. All projects will be evaluated according to the following criteria to qualify for Disproportionate Impact funding:

    a. Poverty Level: All projects in areas where at least 10 percent of the population falls below the Federal poverty level based on the year 2000 census data, will be eligible to be included in this category, and

    b. PM Exposure: All projects in areas with the highest 15 percent of PM concentration will be eligible to be ranked in this category. The highest 15 percent of PM concentration is 46 micrograms per cubic meter and above, on an annual average, or

    c. Toxic Exposure: All projects listed in the Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES II) report[1] as having a cancer risk of 1,000 in a million and above will be eligible to be ranked in this category.

[1] Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES II), SCAQMD, March 2000.

Data for the poverty level and PM and toxic exposures were obtained from the U.S. Census, the 1998 AQMD monitoring data and Mates II study respectively.

3. Fifty percent of the funding available for this PA (#2007-08) will be allocated among proposals located in disproportionately impacted areas. If the funding for disproportionately impacted areas is not exhausted with the outlined methodology, then staff will return to the Governing Board for direction. If funding requests exceed 50 percent of the total available funding, then all qualified projects will be ranked based on their disproportionate impact. Each project will be assigned a score that is comprised of 40 percent for poverty level, and 30 percent each for PM and toxic exposures. Proposals with the highest scores will receive funding until 50 percent of the total funding is allocated.

   All the proposals not awarded under the fifty percent disproportionate impact funding analysis will then be ranked according to cost-effectiveness, with the most cost-effective project funded first and then in descending order for each funding category until the remainder of the Moyer Funds are exhausted. Some projects that exceed the cost-effectiveness ceiling may receive partial funding, depending on their rankings.

ELIGIBLE COSTS

Eligible project costs (i.e., costs for which Moyer funding is requested) for idling reductions include

- The actual capital cost, up to $5,500, of a diesel or diesel-electric auxiliary power unit (APU)[2] may be eligible for funding. Diesel APU must meet new off-road diesel engine emission standard not increase PM.
- The installation cost of an APU, including installation of an hour-meter, up to a maximum of $1,700 per diesel APU and a maximum of $3,400 per alternative fuel, electric motor, or fuel cell APU, may be funded.
- The full cost of a PM retrofit device may be funded provided that the cost-effectiveness for the overall project does not exceed $5,000/ton.

Operation and maintenance costs are not eligible for CMP funding. Please refer to the Project Types section below for additional detail.

REPORTING AND MONITORING

All participants in the CMP are required to keep appropriate records during the full contract period. Records must be retained and updated throughout the

[2] Note that the CARB Idling Emissions Measure refers to an auxiliary power system or APS

project life and made available for AQMD inspection. Project life is the number of years used to determine the cost-effectiveness and is equivalent to the contract life. All equipment must operate in the AQMD for this full project life. Periodic reviews of each project's operating records to ensure that the equipment is operated as stated in the program application may be conducted by AQMD and/or ARB. Annual records must contain, at a minimum:

- Total miles traveled
- Total miles traveled in the South Coast Air Basin
- Annual fuel consumed
- Annual maintenance and repair information

Records must be retained and updated throughout the project life and made available for AQMD inspection. The AQMD may conduct periodic reviews of each vehicle/equipment project's operating records to ensure that the vehicle is operated as required by the project requirements.

COST-EFFECTIVENESS EVALUATION DISCUSSION

Cost-effectiveness calculations are based on particulate matter (PM10), oxides of nitrogen (NOx), and reactive organic gases (ROG). The new formula established by CARB is highlighted above. AQMD staff will calculate the NOx, PM and ROG emissions reductions and apply the new formula during the evaluation process. Only CMP funds are to be used in determining cost-effectiveness[3]. The one-time incentive grant amount is to be amortized over the project life (which is also the contract term) at a discount rate of 4 percent. The amortization formula (given below) yields a capital recovery factor (CRF), which, when multiplied by the initial capital cost, gives the annual cost of a project over its project term.

$$CRF = [(1 + i)^n (i)] / [(1 + i)^n - 1]$$

where

i = discount rate (4 percent)
n = project life (at least 3 years)

Table 3.1 lists the CRF for different project lives using a discount rate of 4 percent. Cost-effectiveness is determined by dividing the annualized costs of a project by the annual weighted emission reductions offered by the project.

[3] Unless the AQMD "buys down" the cost of the project by adding additional funding, in which case the total grant funding amount should be used for the cost-effectiveness calculation.

Table 3.1 – Capital Recovery Factors (CRF) for Various Project Lives At 4 Percent Discount Rate

Project Life	CRF
3	0.360
4	0.275
5	0.225
6	0.191
7	0.167
8	0.149
9	0.134
10	0.123
11	0.114
12	0.107
13	0.100
14	0.095
15	0.090
16	0.086
17	0.082
18	0.079
19	0.076
20	0.074

PROJECT LIFE

As discussed above, a key parameter in the determination of a project's emission reduction benefit is its project life. The minimum project life is three (3) years although a shorter life may be acceptable on a case-by-case.

Below are excerpts[4] from CARB's CMP Guidelines (Chapter 3 – Reducing Idling Emissions from Heavy-Duty Vehicles)

I. Introduction

The Carl Moyer Program can provide incentives to reduce emissions from truck idling by encouraging the purchase and installation of alternative idling reduction technologies. These technologies not only reduce idling emissions from heavy-duty trucks, but can also result in fuel savings and reduced maintenance costs to truck operators.

II. Emissions

Idling emissions from individual trucks are significant, for example, a single HHD truck that idles an average of 1,500 hours per year emits approximately: 564 pounds/year of NOx, 114 pounds/year of ROG and 7.6 pounds/year of PM10 from idling.

[4] The information below is excerpted from CARB's 2005 CMP Guidelines. Not all sections of the guidelines were pasted here, but CARB numbering was retained to stay consistent with CARB Guidelines for easy cross-reference.

III. Regulatory Requirements

Recent airborne toxic control measures (ATCM) have placed a number of restrictions on idling. Only projects that have emission reductions that exceed these measures are eligible.

A. School Bus Idling

An ATCM became effective on July 16, 2003, that restricts idling by school buses and other special classes of vehicles at schools. The regulation also limited the idling of these buses and vehicles to no more than five minutes when within 100 feet of a school. [ARB, 2003]

B. Heavy-Duty Vehicle Idling

On February 1, 2005, an ATCM became effective that extended idling limitations beyond school buses to include diesel APUs, and heavy-duty diesel trucks over 10,000 GVWR. The ATCM specifically limits idling of the main engine or the operation of diesel-fueled APU systems when health, safety or operational concerns are not an issue. This regulation limits the idling of HDVs to no more than five minutes if the truck is within 100 feet of a school or home. These requirements apply to both California and non-California trucks.

In addition to statewide restrictions on idling, some local government and municipalities have ordinances restricting idling time for some types of vehicles. Carl Moyer Program funding for projects must be surplus to the requirements of both the ATCM and local ordinances.

C. Idling Restrictions

In October 2005, the Air Resources Board extended idling restrictions to heavy duty trucks equipped with sleeper berths. This measure prohibits heavy duty trucks with sleeper berths from idling more than five minutes unless certain conditions are met. Beginning in 2008, model year 2006 and older trucks may operate certified diesel APUs. Model year 2007 and newer trucks may only operate an APU for longer than 5 minutes if the exhaust of the APU is equipped with a Level 3 PM retrofit device or is routed through the main engine exhaust with a Level 3 PM retrofit device; however, the truck must not be within 100 feet of a restricted area such as a school or residential area. In addition, 2008 and subsequent model year heavy-duty trucks may idle longer than five minutes in a non-restricted area if the main engine meets a low NOx standard of 30 g/hr.

The Board approval of the regulation means that beginning with the 2008 calendar year, the baseline for calculating the benefits of truck idle reduction projects will be the15.1 g/hr NMHC + NOx and .087 of PM emission rate assumed in the idling regulation.

IV. Potential Projects

A. Auxiliary Power Units

APUs are usually installed on the truck chassis outside the truck cab to provide power for the truck’s accessory loads and to keep the engine warm when the

truck is parked. This allows the operator to refrain from idling the truck's main engine. The extent of labor involved in the installation of an APU on the truck depends on the configuration of the truck engine and chassis and the plumbing of its heating/cooling system. Heating and cooling of the cab compartment are accomplished through either dedicated equipment supplied with the APU or through the truck's existing heating and cooling system. APUs are commercially available and meet most of the power needs of truck operators. Some APUs are available with an electric option for a few hundred dollars more.

B. Truck Stop Electrification

Another strategy for reducing truck idling is the retrofit of trucks with components such as engine block heaters, fuel heaters, electric heaters and air conditioning for cab/sleeper areas. This strategy requires the installation of charging infrastructure at truck stops and rest areas. Specific information and project criteria pertaining to truck stop electrification is provided in Chapter 12: Zero-Emission Technologies.

C. Advanced Travel Center Electrification

An alternative to truck stop electrification that does not require truck modification has been introduced by IdleAire Technologies. Specific information and project criteria are provided in Chapter 12: Zero-Emission Technologies.

D. Direct-Fired Heaters and Thermal Storage

Direct-fired heaters for truck heating applications are devices that use the combustion heat of a small internal combustion engine to provide heat directly to the truck's cab/sleeper area through the use of a small heat exchanger. Because it is designed to provide heat directly from a combustion flame, the heating efficiency of these units is higher than that obtained through the truck's engine due to reduced mechanical losses and fuel consumption. Two primary limitations of direct-fired heaters for this application are that they cannot provide cooling and are that they draw on the truck's battery power during operation. Direct-fired heater technologies continue to evolve, but they have not gained widespread commercial acceptance.

Thermal storage systems provide both heating and cooling for the cab/sleeper area. This technology uses the heat of transformation associated with material phase change to provide heating and cooling to the cab/sleeper area. However, the technology cannot provide cooling at night unless the truck's air conditioner was used in the daytime.

V. Proposed Project Criteria

The project criteria for eligible idling reduction strategies for heavy-duty vehicles provide districts and fleet operators with the minimum requirements for participation in the Carl Moyer Program. The criteria have been developed specifically for idling reduction technologies that will be installed on a heavy-duty truck to reduce the truck's idling emissions. The ARB may develop additional project criteria for idling reduction strategies if additional technologies enter the

market.

Idling reduction technologies provide a cost-effective means to reduce idling emissions from heavy-duty diesel trucks. Carl Moyer Program funds can be used to pay for a portion of the capital cost of idling reduction equipment as well as the installation costs.

A. General Criteria

- Emission reductions obtained through Carl Moyer Program projects must not be required by any federal, state or local regulation, memorandum of agreement/understanding, settlement agreement, mitigation requirement, or other legally binding document.

  Projects must meet a cost-effectiveness of $5,000 per weighed ton of NOx + ROG + combustion PM10, reduced calculated in accordance with the cost-effectiveness methodology discussed in this section.
- No emission reductions generated with funding from the Carl Moyer Program shall be used as marketable emission reduction credits, or to satisfy any emission reduction obligation of any person or entity.
- No emission reductions from a project funded by the Carl Moyer Program shall be used for credit under any federal or state emission averaging, banking and trading program
- Carl Moyer Program grants shall be no greater than a project's incremental cost. The incremental cost is the cost of the project minus the baseline cost. The incremental cost shall be reduced by the value of any current financial incentive that reduces the project price, including but not limited to tax credits or deductions, grants, or other public financial assistance.
- Projects must have a minimum project life of three years. The ARB may approve shorter project life in writing for good cause on a case-by-case basis. Projects with shorter lives may be subject to additional funding restrictions, such as a lower cost-effectiveness limit or a project cost cap.
- The contract term must extend to the end of the project life.
- The default project life does not consider upcoming regulatory requirements. Project life may be shorter due to regulatory requirements.
- Air districts must consult with ARB staff to determine eligibility of all projects considered for funding on case-by-case basis. All projects considered on a case-by-case basis must receive ARB approval prior to receiving program funding.
- Repower projects must provide at least a 15 percent NOx emission benefit compared to baseline idling NOx emissions.
- Air districts are encouraged to co-fund projects that will produce emission reductions in more than one air district.

- Potential projects that fall outside of these criteria may be considered on a case-by-case basis is evidence provided to the air district suggests potential surplus, real, quantifiable and enforceable emission reduction benefits.

B. APUs and Alternative Technologies

- The engine used in an APU must meet current emission standards, be certified by the ARB for sale in California, and comply with all applicable durability and warranty requirements.
- If an internal combustion engine APU is available with an electric option, the incremental cost of the plug-in option is eligible for Carl Moyer Program funding.
- An hour-meter or other means to measure usage must be installed with an APU to track operation. The participant shall provide this information to ARB or the district upon request during the life of the project.
- The default load factor for the engine used in an APU shall be the maximum power rating of the engine, unless another load factor is proposed by the participant and supported by proper documentation as determined by the ARB.
- Emission benefits must be based on the vehicle's idling time that occurs in the South Coast Air Basin. At least 75 percent of the idling time must be in the South Coast Air Basin. AQMD may approve exceptions on a case-by-case basis.
- The actual capital cost, up to $5,500, of an APU may be eligible for funding.
- The installation cost of an APU, including installation of an hour-meter, up to a maximum of $1,700 per diesel APU and a maximum of $3,400 per alternative fuel, electric motor, or fuel cell APU, may be funded.
- APUs must either be fitted with a verified level retrofit device or the APU's exhaust must be routed through the truck's PM filter.
- The full cost of a PM retrofit device may be funded provided that the cost-effectiveness for the overall project does not exceed 5,000.

C. Scrap

- Scrap requirements are described in the 2005 Carl Moyer Program Guidelines, Part I, Chapter 2: Administration of the Carl Moyer Program.